A comparative study on intrinsic-extrinsic factor Influencing the choosing or rejecting of science subjects by Higher secondary students shaping their decisions in Darbhanga district.

SYNOPSIS

SUBMITTED TO THE LNMU DARBHANGA
FOR THE DEGREE OF

DOCTOR IN PHILOSOPHY

Supervisor

31/01/2024

Principal
FAATTC Darbhanga

Investigator

31.01.2024

PAT 2021-22
Roll No - 07

DEPARTMENT OF EDUCATION

LALIT NARAYAN MITHILA UNIVERSITY

DARBHANGA, BIHAR -846001

Introduction

Our modern society is dependent on science to provide new knowledge, technologies, and solutions to pressing world problems. However, many children become disillusionment with science when they enter high school and develop a view that the subject is inappropriate and uninteresting. When given the opportunity to choose subjects for their final years of schooling, students do not choose a science subject for their final two years of schooling and instead choose alternative subjects from the wide range of courses available to them.

The study of science in the final years of school is critical to the flow of the scientifically trained individuals needed for our modern society because the subject selection decisions that teenagers make influence their potential career paths. Senior study in science provides a path to not only potential careers in science but also a scientifically literate community that is needed for social and economic progress.

The importance of maintaining and enhancing the flow of scientists and increasing the scientific literacy of the general populace means it is critical to study the decision point at which students choose not to continue with science when given the choice at school. Given the widely held view of the importance of science, technology, engineering and mathematics (STEM) skills to economic prosperity, the fall in enrolments in senior science subjects that has occurred in recent decades is of concern to educators and policymakers in many nations. This research will investigate how students will be influenced to continue with the study of science by asking the research question, "What is the relative importance of intrinsic-extrinsic factors such as personal interest, career goals, parental influence and educational institution's guidance that influence students' choices when selecting subjects for their higher education?"

Review of Literature

Review of literature is very important part of research. It provides a clear understanding about his problem. Researcher can know how much study have been done till now, how is he differ from others, which methods are used mainly in his field, which are other part effective parts of this study?

Ainley, Kos, & Nicholas, 2008; Henriksen, 2015; Lyons & Quinn, 2010, Regan & DeWitt, 2015 conducted a research paper on **The Factors influencing Students' choices to ontinue with Science at School or not.** The factors commonly cited as being major influencers of the decision to choose science at school are: students' engagement in previous school science, their perceptions of the usefulness of science, socioeconomic factors, gender preferences for some science subjects, and the decreased relative popularity of science as a subject generally. In order to provide a coherent and brief description of the factors that may impact on students' choice of science, we have classified these factors into two areas: *intrinsic* factors relating to the student themselves and their preferences, and *extrinsic* factors relating to the environment within which subject choice is made.

Intrinsic Factors for Choice of Science

The intrinsic factors impacting on students' choice of science are grouped into four themes for discussion: attitudes; Interest and engagement; ability and self-efficacy; and gender.

Attitudes. Students' attitudes to different aspects of science are important in understanding the decline in students choosing science **(Osborne, Simon & Collins, 2003). Tytler and Osborne's (2012)** review of student attitudes and aspirations towards science illustrates the extensive research in this area over many years. This research shows that students' attitudes towards school science are typically positive, although these decline through adolescence. School science is also less popular than other subjects. There is some agreement among academics that students' attitudes towards doing school science is declining in Western societies. However, **Lyons and Quinn (2010)** note that Australian students' attitudes towards science and scientists and their enjoyment of the subject are not significantly different from those expressed by students

31.01.2024 31/01/2024

two decades ago when science enrolments were high. Further, a longitudinal study in England found the majority of the 5600 children surveyed enjoyed science in secondary school and had a positive view of scientists **(DeWitt, Archer, & Osborne, 2014).**

Interest and engagement. According to **Ainley and Ainley (2011),** students' interest in and enjoyment of science are closely related. Their analysis of 2006 data from the Program for International Student Assessment (PISA) shows that individual interest and engagement in science are important in the formation of adolescents' intentions to continue with learning about science. The development of personal interests (defined as the motivation to pursue an objective) is believed to be strongly related to subject choice and subsequent vocational choice **(Elsworth, Harvey-Beavis, Ainley, & Fabris, 1999).** By mid to late adolescence, students are likely to have formed an enduring interest in activities in which they see themselves as competent and from which they expect to receive valued outcomes.

Ability and self-efficacy. Academic success in a subject (ability) is linked to students' attitudes, self-efficacy and interest in a subject. The beliefs adolescents have about their abilities influence their choices as well as their lives **(Bandura, 2006).** Interest and achievement in a subject are related to a students' academic success in that subject and are likely to lead to even further interest in it **(Brown & Lent, 2006; Kidman, 2009).** Students who are successful in science in their earlier years are generally those who are encouraged to continue with the science when it becomes an elective **(Smith & Gorard, 2011).** Students who perceive that they lack ability in science state this is a reason for not choosing to study post-compulsory science **(Lyons & Quinn, 2010).** There is evidence that students may not choose Physics and Chemistry in particular, as they believe it is more difficult to achieve high marks in these subjects **(Ainley et al., 2008; Lyons & Quinn, 2010).**

Gender. Gender-based preferencing of some science subjects has been suggested as an important factor affecting choice of science at school, particularly with respect to the underrepresentation of girls in science **(Ceci & Williams, 2007; Kessels & Taconis, 2012).** According to **Regan and DeWitt (2015),** important factors contributing to fewer girls choosing science are that girls consistently show less positive attitudes to it than boys, display lower self-efficacy in it, and may identify science as being a "masculine" pursuit. **Blickenstaff's (2005)** review of 30 years of research into explanations for the underrepresentation of women in STEM suggests that the problem is complex and unresolved, but he argues that genetic differences between the sexes are not the reason for lower participation. He suggests that improvements in the teaching of science may improve female participation rates. A meta-analysis study on gender and science reasearch conducted by the European Commission on gender

31.01.2024 31/01/2024

segregation in research careers states that a change in culture of science and research will be required to encourage more women to study science **(Caprile, 2012).**

Extrinsic Factors for Choice of Science

Factors within the immediate school and home environments of students have been found to be associated with the decline in choice of science for further study **(Cleaves, 2005).** We group the impact of extrinsic factors on the choice of science into five themes for discussion: socioeconomic factors; persons of influence; teaching and curriculum; careers; and logistics of choice.

Socio-economic factors. The socio-economic status of a student and the socioeconomic composition of their school are associated with a student's choice of, and performance in, science **(Smith & Gorard, 2011; McConney & Perry, 2010; Ainley et al., 2008; Anderhag, Emanuelsson, Wickman, & Hamza, 2013).** Students from poorer socio-economic and nonEnglish speaking backgrounds are less likely to choose science than those from more affluent families and those where English is a first language **(Ainley et al., 2008).**

***Persons of influence*:** Teachers, parents and peers are believed to influence a students' interest and achievement in science. Students who have parents with better educations are more likely to choose science **(Anderhag et al., 2013). Henriksen, Jensen, and Sjaastad (2015)** found in their study of 5007 Norwegian students that parents who were engaged in STEM make the choice of STEM likely for children and that teachers can influence science choice by giving pupils positive experiences with the subject. The impact that peers have on choice of science is not clear; although during the period in which subjects are chosen, the influence of peers on other aspects of an adolescent's life is considerable **(Ryan, 2000; Santrock, 2010).**

Teaching and curriculum. While both science and non-science teachers can advise and influence students in their decision making about subjects for study, it is in the classroom where much of the experiences around a subject occur. Teaching quality has therefore been suggested as an important factor in student's choices of particular school subjects, and their engagement and success in them **(Tytler, 2007; Tytler & Osborne, 2012).** However, science teaching has been criticised for remaining unchanged for decades – utilising transmissive, traditional teaching techniques that conflict with the needs of modern students **(Goodrum et al., 2001; Tytler, 2007).** If students see classroom science as uninteresting and difficult, this can negatively affect their interest,

31.01.2024 31/01/2024

self-efficacy and attitude towards the field and, in turn, reduce the likelihood of choosing a science subject **(Christidou, 2011; Goodrum et al., 2012).**

Careers. The subjects students choose to study in their final years influence the career and study options open to them **(Bøe, Henriksen, Lyons, & Schreiner, 2011; Thomson, 2005).** Senior students have reported that they chose science to meet university prerequisites and to maintain their career options **(Goodrum et al., 2012).** The choice of science is an important decision on the path to a STEM-related career **(Thomson, 2005, Warton & Cooney 1997).** In a study of physics choice in secondary education, **Stokking (2000)** found that the future relevance of the subject for further study or for entering a profession were the main predictors of students deciding to study physics. In addition, there is concern that school students may not choose science because they are unaware of the diversity and nature of science-related careers **(Goodrum et al., 2012).** The conceptions that students have of science as being difficult, isolating and uncreative, as well as stereotypical images of scientists (in laboratory coats and safety glasses), also influence the science subject choice decision **(Regan & DeWitt, 2015).** Several authors have argued that increased knowledge of the relevance of a science degree, and a more authentic understanding of the nature and practicalities of being a scientist, may improve the perception of science as a career **(Cleaves, 2005; Rodrigues, Tytler, Darby, Hubber, Symington, & Edwards, 2007; Tytler & Osborne, 2012).**

Logistics of choice. Students often choose subjects from an extensive range of subjects available and this has led to the suggestion that competition among these subjects may result in fewer students choosing science **(Lyons & Quinn, 2010).** Restrictions in the timetabling of subjects for senior students can also mean that some subjects may be unavailable to students. **Goodrum et al. (2012)** provides evidence of students who did not choose science mentioning timetable limitations as a reason for their choice. Further, not all schools make all science subjects available. **Harris, Baldwin and Jensz (2005)** conducted a study of 219 Australian schools and found that 20% of the schools did not offer a senior subject in either Biology, Chemistry or Physics and 4% did not offer any of these three subjects.

In summary, the literature suggests many interrelated factors influence student choices to continue studies in science. The impact of individual factors is difficult to determine, and their relative importance to student's decisions is not fully understood. This makes it difficult to formulate strategies that might remedy the problem of lower than desirable enrolments in science. To address this gap in our knowledge, we used a Best Worst Scaling (BWS) methodology **(Louviere, Finn, & Marley, 2015)** to

21.01.2024 31/01/2024

quantify and rank the importance of factors students consider in their subject selection decision.

31.01.2024

31/01/2024

Bøe, M. V., Henriksen, E. K., Lyons, T., & Schreiner, C. (2011). Participation in science and technology: Young people's achievement related choices in late modern societies. *Studies in Science Education, 47*(1), 37–72.

ERS' TRAINING

31.01.2024

31/01/24

Objectives of the Study

Objectives give the perfect direction to the research and researcher. By keeping in the mind the objectives of the study, the whole process of research is analysed. To do any work it is first necessary to decide its objectives. Objectives have its own importance in any research work. The present study has the following objectives.

This research going to identify about the intrinsic-extrinsic factors of students choose or reject science subject for their higher education in Darbhanga district.

(1) To explore the intrinsic motivations, including personal interests and passion that drive students to choose science subjects for their higher education.

(2) To examine the extrinsic factor, such as parental expectation and societal pressures, that influence subject selection among school students.

(3) To investigate how a student's self-efficacy, confidence, and innate abilities in science subject interact with external influences in shaping their decisions.

(4) To understand how career aspiration and long term goals, both intrinsic and extrinsic impact students' choices regarding science subjects.

(5) To identify the barriers and challenges, both internal and external, that lead some student science subjects.

(6) To analyse the interplay between intrinsic motivation and extrinsic factor in the decision-making process.

31.01.2024

31/01/2024

(7) To determine the way in which educational resource, teaching quality, and available extracurricular opportunities affect subject preferences.

(8) To provide recommendations for educational institutions and policymakers to create an environment that balances intrinsic and extrinsic motivations for science subject selections.

(9) To gain insights into how mentors and teachers can foster both internal and external support for students pursuing science subjects.

(10) To contribute a comprehensive understanding of the holistic factors that influence students' choices regarding science subjects for their higher education.

These objectives will allow you to investigate how both intrinsic and extrinsic factors interact to shape students' decisions regarding science subjects, providing a more comprehensive view of the decision-making process.

Hypothesis of the Study

Ho_1: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary government and private school in Darbhanga district.

Ho_2: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary government school of male and female students studying in Darbhanga district.

31.01.2024 31/01/2024

H_{O3}: There will be no significance difference intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary private school of male female students studying in Darbhanga district.

H_{O4}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary male and female students studying in English medium schools in Darbhanga district.

H_{O5}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary male female students studying in Hindi medium schools in Darbhanga district.

H_{O6}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary male female students studying in rural areas in Darbhanga district.

H_{O7}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary male female students studying in urban areas in Darbhanga district.

H_{O8}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary students studying in government and private schools in rural areas in Darbhanga district.

H_{O9}: : There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary students studying government and private schools in urban areas in Darbhanga district.

31.01.2024 31/01/2024

H_{O10}: : There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary students of government and private in Hindi medium schools in Darbhanga district.

H_{O11}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary Hindi and English medium students studying in Darbhanga district.

H_{O12}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary Hindi and English medium students studying in rural areas in Darbhanga district.

H_{O13}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary Hindi and English medium students studying in urban areas in Darbhanga district.

H_{O14}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary Hindi and English medium male students studying in Darbhanga district.

H_{O15}: There will be no significance difference between intrinsic-extrinsic factors considered by the students while selecting or rejecting the science subject of higher secondary Hindi and English medium female students studying in Darbhanga district.

Methodology

In order to determine the relative importance of intrinsic-extrinsic factors students consider in choosing or rejecting a subject for their higher education, a questionnaire survey will conduct with 500 students (age group 16-18) from selecting ten randomly higher secondary school.

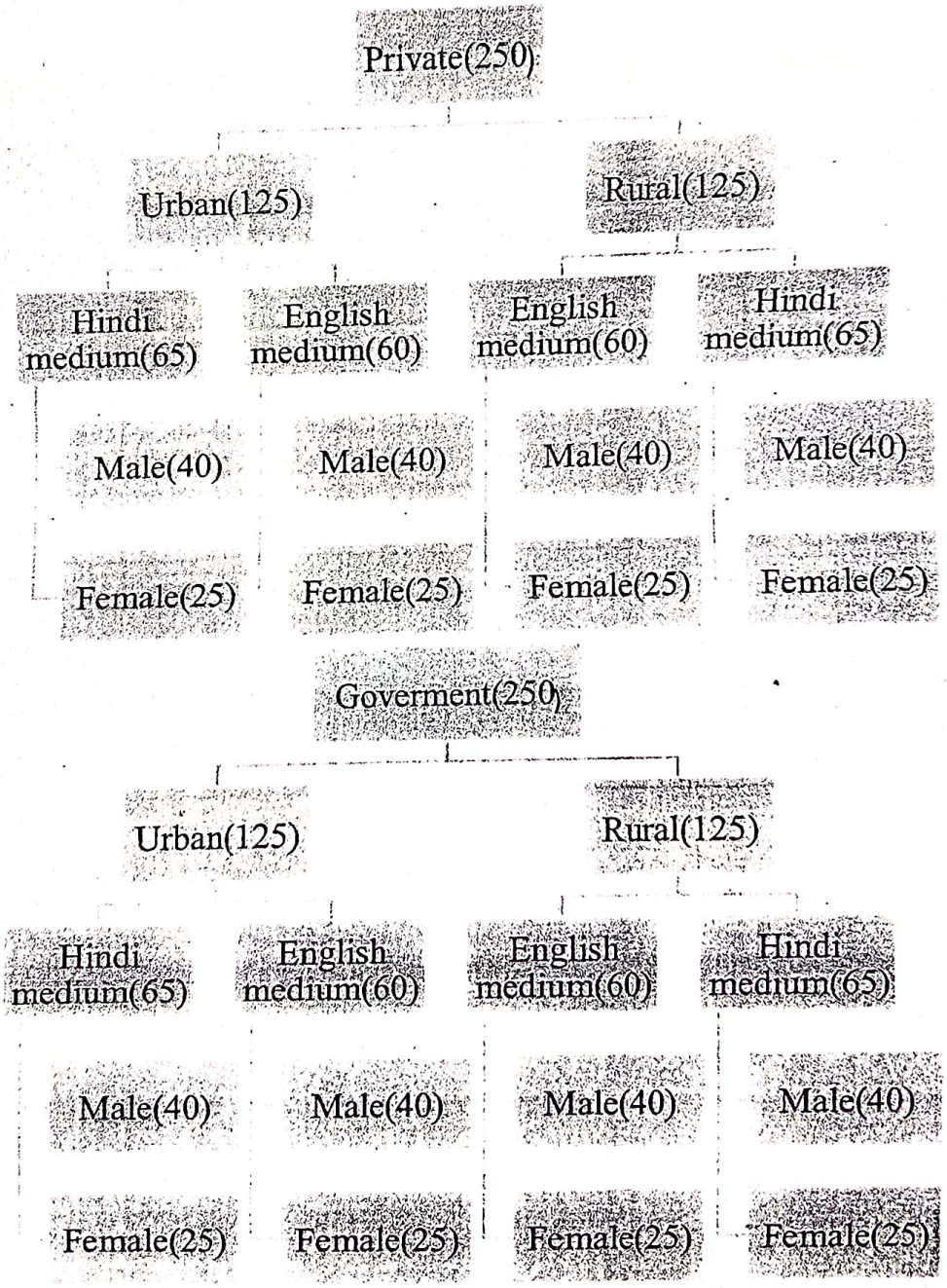
31.01.2024 31/01/2024

Questionnaire survey

Introduction: Thank you for participating in our survey. Your input will help us better understand the factor that influence students' decision when it comes to choosing or rejecting science subjects for higher secondary education.

Study population: 10 higher secondary school in Darbhanga district.

- Higher Secondary Students (500) Bifurcate in two Part Private and Government.



31.01.2024

31/01/2024

Sampling method: Stratified Sampling: This method divides the population into subgroups or strata based on certain characteristics (e.g., age, gender), and then random samples are drawn from each stratum. This ensures representations from all subgroups.

Tools data collection.

For the data collection, the research will use the self-constructed questionnaire on Bestworst scale for higher secondary students and other tool as per the need of study.

Statistical Techniques.

In this research, analysis of the collected data will be done by mean, S.D., t-test, chisquare, and ANOVA.

Time line: 3 years.

Resources: Higher secondary school.

Limitations: Darbhanga district.

31.01.2024

31/01/2024

Work Plan for the study

Work plan suggests a way to work. This is for systematically work. Without work plan research looks like direction less ship in sea. Following chapter will be plan for present study.

No	Topic
Chapter - 1	Introduction
Chapter - 2	Review of Literature
Chapter - 3	Methodology
Chapter - 4	Data Analysis
Chapter - 5	Summary, conclusion and suggestions

31.01.2024

31/01/2024

References

Ainley, M. & Ainley, J. (2011). Student engagement with science in early adolescence: The contribution of enjoyment to students' continuing interest in learning about science. *Contemporary Educational Psychology*, *36*(1), 4-12.

Ainley, J., Kos, J., & Nicholas, M. (2008). *Participation in science, mathematics and technology in Australian education*. Melbourne: ACER Research Monograph.

Anderhag, P., Emanuelsson, P., Wickman, P. O., & Hamza, K. M. (2013). Students' Choice of Post-Compulsory science: In search of schools that compensate for the socio-economic background of their students. *International Journal of Science Education*, *35*(18), 31413160.

Aschbacher, P. R., Li, E., & Roth, E. J. (2010). Is science me? High school students' identities, participation and aspirations in science, engineering, and medicine. *Journal of Research in Science Teaching*, *47*(5), 564-582.

Bandura, A. (2006). Adolescent development from an agentic perspective. In F. Pajares & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (Vol. 5., pp. 1–43). Greenwich, CT: IAP - Information Age Publishing.

Blickenstaff, J.C. (2005). Women and science careers: leaky pipeline or gender filter? *Gender and education*, *17*(4), 369-386.

31.01.2024 31/01/2024